

MICROSCOPICAL EXAMINATION OF THE BRAIN AND SPINAL CORD OF AN EPILEPTIC.

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THE following report constituted a portion of the Inaugural Thesis of Dr. James Kingsbury, of Newtown, Sydney, Australia (University of Pennsylvania, 1881). The patient at the time of her death was in the *Philadelphia Hospital*, in the wards of Dr. Mills, by whom the clinical notes and hardened specimens were furnished to Dr. Kingsbury.

M. W., aged forty-seven, had had "fits" since she was an infant. During childhood she would have seizures at irregular intervals, sometimes weeks and sometimes months intervening between them. When eight years old, in one of the attacks she fell into the fire and burned herself severely. After getting married, about the time she became of age, the seizures became more frequent and severe. During pregnancy they would recur as often as once or twice a week.

Some facts in regard to special features of her attacks were obtained from her daughter. They were usually of the grave type of epilepsy, although occasionally between the violent paroxysms she would have spells of *petit mal*, in one of which she fell and broke her leg. Before a grave seizure she would have headache. Just preceding it, she would become giddy, her sight would leave her, and she would usually cry out, "Oh, my head is bad!" Sometimes she would ask for a glass of water, but before she could get it to her mouth, she would fall backward. Her daughter thought that her face was at first pale, and afterward very red or purple.

Her eyes would turn upward. She would usually bite her tongue ; and had bitten spoons in two during her paroxysms. She frothed at the mouth, and was convulsed all over ; working both hands and feet violently. Occasionally she would pass her urine during the paroxysm.

During the last twelve or fifteen years of her life, the seizures were scarcely ever single, the condition known as *status epilepticus* usually occurring. One fit would follow another for periods of from eight to twenty-four hours. After all the seizures were over she would go into a deep sleep for some hours. On coming out of the sleep she would vomit, and would again have great headache, and would be very weak for a couple of days.

Ten years before her death she was decidedly insane for several weeks, and afterward was "a little queer in the head." During the year preceding her death she suffered greatly with neuralgia, which chiefly affected the right eye. The sight of this eye was very dim, and the ball turned inward. The sight of the other eye was also defective, but less so than that of the left. She was partially deaf in her left ear, and smell and taste were blunted. She had never been paralyzed.

A brother, who died of phthisis, had been an epileptic ; and a daughter was also the victim of epilepsy, having seizures once in two or three months.

She was admitted into the *Women's Nervous Ward* of the Philadelphia Hospital, at the beginning of a series of violent convulsions, which lasted nearly two days. She lived ten days after the last paroxysm, but never rallied from a semi-comatose condition.

A post-mortem examination was made four hours after death. External examination showed no scars or evidences of injury. The head was small. The skull was thicker than usual. The brain, after removal, seemed too large for the skull. Little fluid or blood escaped. The weight of the entire brain was thirty-six ounces. A small clot, probably post-mortem, was found in the superior longitudinal sinus. No pachymeningitis was present. The pia mater was everywhere transparent ; it showed no signs of old or recent inflammation. The Pacchionian granulations were not perceptible. The brain was of very firm consistence.

The pons and medulla oblongata were smaller than usual. Special appearances were observed on the floor of the fourth ventricle. At the upper part of the right ala cinerea a small extravasation was seen in the substance of the ventricular floor, and on the left of the median line, in an exactly corresponding spot, was a deeply congested appearance. Just below the locus cinereus, on each side, was a small blood-point or spot. About the centre of the floor of the ventricle was a similar appearance. Minute hemorrhagic points were scattered here and there over the floor of the ventricle and the beginning of the *curva cerebelli*.

Numerous cross-sections were made through the cord. The postero-lateral columns presented yellowish-brown streaks. A small hemorrhagic focus was found in the anterior horn, about one inch below the junction of the cord with the medulla oblongata.

The left kidney was slightly cirrhotic. A small cicatrix was found in the apex of the left lung.

The brain and spinal cord were prepared for microscopical investigation with great care by the following method: A one-per-cent. solution of chromic acid was made. To this was added an equal amount of 95 per cent. alcohol, and the specimens were placed in this solution. A fresh solution of the same kind was used every day for one week, and every other day for a second week. At the end of this time the specimens were placed in strong alcohol. They were kept constantly in the cold. They hardened perfectly.

Blocks of brain tissue were removed from regions mentioned in the following report, and again put into hardening fluid. The microscopical sections were in those of the convolutions all vertical, and were of sufficient size to show the entire depth of gray cortex and some white matter beyond. Those of the ganglia and tracts were also vertical, and large enough to include ganglia and capsules. They showed, in

other words, in the special sections studied, a part of optic thalamus, tail of caudate nucleus, posterior portion of internal capsule, lenticular nucleus, and external capsule. A longitudinal section of entire pons and medulla oblongata in its posterior half was made with Dr. Seiler's microtome. With this exception all the sections were cut by hand by Dr. Kingsbury. The spinal-cord sections were transverse.

MICROSCOPICAL REPORT.

Anterior end of right frontal lobe.—Every thing normal except an increase in the cells of the neuroglia, in both the gray and the white matter, but particularly the latter, with some obliteration of the perivascular spaces.

Anterior end of left frontal lobe.—Is the same as its fellow, only the obliteration of the perivascular spaces is less marked.

Along fissure of Rolando, right side.—A slight increase in the cells of the neuroglia of both the gray and white matter. The periganglionic spaces not well marked. The perivascular spaces are intact.

Fissure of Rolando, left side.—Just as the right side, but in less degree.

Anterior portion of right cornu Ammonis—gray matter.—Many of the perivascular spaces narrowed, and some have entirely disappeared. This appearance does not seem to be due to an actual filling up of cells, but probably to dilatation of the blood-vessels. In some places the spaces are intact. The obliterated spaces are apparently limited to certain regions mostly peripheral. The periganglionic spaces are barely noticeable, and the ganglionic cells appear to be more granular than normal. The cells of the neuroglia are increased, and appear unusually granular.

White matter.—The obliteration of the perivascular spaces still more marked, only a few of the larger vessels showing them. The cells of the neuroglia are decidedly increased and granular, and appear cloudy, though the specimen has been most perfectly prepared. This turbidity diminishes as we approach the gray matter, where it is entirely lost. Blood-vessels dilated.

Anterior portion of left cornu Ammonis—gray matter.—The perivascular spaces much less obliterated as compared with the right side. The periganglionic spaces are somewhat diminished. The ganglionic cells are more granular than normal. There is

seen a small saccular aneurism of an arteriole in one of the fissures.

White matter.—The same as the opposite side, only in less degree. Blood-vessels somewhat dilated.

Posterior portion of right cornu Ammonis—gray matter.—The perivascular spaces are very decidedly obliterated. The periganglionic spaces are not noticeable. The ganglionic cells have a normal appearance. The cells of the neuroglia are increased. In certain places the specimen did not take the staining well, indicating some retrograde change in its elements.

White matter.—The perivascular spaces are less obliterated, but the blood-vessels are much dilated, and many of them are filled with blood. The cells of the neuroglia are increased in number, at some points more than others.

Posterior portion of left cornu Ammonis—gray matter.—The perivascular spaces are less obliterated, some being quite normal. The periganglionic spaces are normal, also the ganglionic cells. The cells of the neuroglia are increased, and somewhat granular. The *white matter* presents the same appearance as the right side, but to a less degree.

Occipital lobe, right side—gray matter.—Increase of the cells of the neuroglia, slight obliteration of the periganglionic and perivascular spaces.

White matter.—Slight increase of the cells of the neuroglia. Blood-vessels dilated and somewhat congested. The perivascular spaces less noticeable than in the gray matter. A remarkable feature is the occurrence in different portions of small capillary abscesses, or rather spots of softening, about the $\frac{1}{10}$ of an inch in diameter, some more, others less; most of them are located by the side of blood-vessels, which would indicate that they are probably due to capillary hemorrhages.

Occipital lobe, left side.—Affected as the opposite side, except perhaps that the abscesses are not quite so numerous.

Ganglia and tracts, right side.—Same as above, there being numerous abscesses.

Ganglia and tracts, left side.—Same appearances seen, but the white matter is full of small capillary infarcts (each not exceeding $\frac{1}{10}$ of an inch in diameter), which have not yet undergone softening, as they show distinct masses of blood corpuscles, which give it a distinct mottled appearance, as greenish or yellowish spots in the already delicate red of the specimen. In some places they have undergone softening. In a limited portion of the gray matter the ganglionic cells are seen to be swollen and pigmented,

and appear highly granular. The periganglionic spaces are completely obliterated. A few of the blood-vessels in the same region appear to have undergone amyloid degeneration. In other places the ganglionic cells are swollen and granular.

Medulla oblongata.—An increase in the cells of the neuroglia throughout the entire section. The blood-vessels are dilated, and the outer walls are very much infiltrated with cellular elements. The ganglionic cells are swollen and granular, filling up the periganglionic spaces.

Spinal cord, upper cervical region—gray matter.—Normal, except congested. *White matter* also congested everywhere. The cells of the neuroglia are increased in the columns of Goll. On one side of the posterior median fissure, is seen a small hemorrhagic infarct, about the $\frac{1}{8}$ of an inch in diameter ; also another upon one of the posterior roots at its exit.

Middle cervical region—gray matter.—Normal, except two small abscesses in the transverse commissure.

White matter.—Increase of the cells of the neuroglia in the columns of Goll.

Lower cervical region.—Slight increase in the cells of the neuroglia in the columns of Goll.

Middle dorsal region.—Same as the last region.

Lower dorsal region.—Same.

Upper lumbar region.—Normal, except slight increase of the cells of the neuroglia in the columns of Goll, and two miliary abscesses in the transverse commissure of the gray matter.

Middle lumbar region.—Normal.

Lower lumbar region.—Normal.

In all the sections the pia mater congested.

In all of the specimens, more or less increase of the neuroglia was present. Dilated blood-vessels, obliterated perivascular spaces, diminished periganglionic spaces, and granular ganglionic cells were the lesions found everywhere in greater or less magnitude. In the frontal and Rolandic regions these conditions were not marked or extensive.

The investigation of the cornua Ammonis is interesting with reference to the researches of Cazauvieille and Bouchut, Bonneville, Charcot, Delasiauve, Meynert, and Hamilton. Sclerosis, or induration of these parts, similar to

that described by the above writers, was certainly found. With reference to these regions, and also all others examined and compared, the pathological changes were more marked on the right than on the left side.

The capillary infarcts, and the minute abscesses or spots of softening (due to capillary hemorrhages) found in the occipital lobes, in the ganglia and tracts, and in the posterior regions of the pons and medulla oblongata, are of great interest.